

Gen. Rothschild:

My opening presentation will be quite short as indicated just in an attempt to establish a common basis for our discussion. I'll first deal with chemical and biological warfare and then talk a little bit about considerations of humanity and morality. Can you hear me alright in back? Toxic warfare is the use of chemical substances or biological materials intentionally disseminated to reduce the military effectiveness of man. It also includes the defense against these things. The materials may be used directly against man or they may be used indirectly through attacks against animals or crops to reduce man's food supply. Let me elaborate first just a little bit on the anti-food warfare as it's the simplest to explain and get over. It could include the use of agents such as 2,4D 245T both ~~herbicides~~ ^{herbicides} to destroy crops. These would normally be disseminated from plants. But also include the use of biological material such as stem-rust of wheat or rice ~~plants~~ ^{blast}. In the case of the chemicals the material is effective only where the agent lands. With the biologicals it is possible to start or an ^{phy}epitotic may start normally through design to effect areas much larger in area in extent than those initially hit.

An attack on animals which would be through biological agents would not only reduce the food supply but would also result in the reduction ^{of} ~~in the~~ available industrial materials such as leather, pharmaceuticals and others. and the reduction of a form of transport which is still very important in many parts of the world.

Now toxic chemical agents may be gas, liquid or solid. "Gas warfare" is still in common usage but it's really a misnomer. Chemical agents may be lethal or they may be incapacitating. Probably the outstanding example of the lethal type is the anticholinesterase series which we call the G-agents.

They're also known as the nerve gases. GB is our standard agent, called sarin by the Germans who first discovered it, is a volatile liquid with an LD₅₀ of 1 milligram. VX is a nonvolatile anticholinesterase agent and is highly effective through the skin as well as through the lungs.

Incapacitating agents are chemicals whose physiological action is reversible or mostly reversible. They may be developed to effect any of the physical capabilities or the mind, and one type which ~~would~~^{might} effect the mind is an LSD-type, this general area. Mustard gas is a chemical agent which does not exactly fit this definition of an incapacitating agent but I so classified it in my book because it causes relatively few deaths and relatively few permanent disabilities. Here too, again ~~liquid gas~~^{the word gas} is a misnomer: mustard gas is a liquid at room temperature, slowly volatilizing. Either the liquid or the vapor will cause burns on contact with the skin, severe irritation on contact with the eye, or damage to the lung when inhaled.

Chemical agents may enter the body through the lungs, the eyes, or the skin. Now the eyes aren't a very important portal of entry because they're too easy to protect, speaking militarily of course. It is possible to gain entry through the skin by mechanical mechanical puncturing as with darts or shell fragments or bullets, or through absorption or penetration of the unbroken skin. The penetration may result in systemic effects as when nerve gases are absorbed through the skin or in local effects as come about after contact with mustard gas. Incidentally, a heavy attack with mustard gas when inhaled can result in systemic effects as well as local burns on the skin.

Biological agents may be viruses, rickettsiae, bacteria or fungi or their toxic products. An example of a virus might be that which causes Venezuelan equine ~~flavivirus~~ encephalomyelitis, an incapacitating disease with quite low

mortality. Or the virus of dengue, breakbone fever, one of the most disabling diseases known to man but practically never kills anyone.

Examples of rickettsiae might be Cocciella burnettiae which causes Q fever, or Rickettsia rickettsiae causing Rocky Mountain Spotted Fever.

^hAnthrax or tularemia are diseases of possible biological warfare interest caused by bacteria. Fungal diseases are probably not of too great interest from a biological warfare viewpoint but a possibility could be Cryptococcus. An example of ^atoxic product which might be used would be botulinum or possibly staphylococcus ^{gastro}enterotoxin.

As indicated by the examples above, the biological agents may also be either lethal or incapacitating. As is inherent in the nature of infectivity and the course of disease there's a definite difference in the meaning of lethality between chemical agents and biological agents.

In order for an agent or an organism to be useful as a military agent it must be able to withstand a number of stresses. These include the rigors of artificial growth, concentration of the agent possibly drying, relatively long periods of storage, dissemination from a munition sometimes explosive, and the disruptive effects of the abrupt humidity changes, temperature changes, and of course sunlight. It's possible through mutation to make an organism more resistant to these stresses within limits. It is also possible to develop organisms which are resistant to drugs of course. The most efficient means of infecting man is through the lungs, even with organisms that do not in nature enter the body that way, as with Pasturella tularensis. However, it is possible to attack through the skin. either with agents that normally enter that way or by using vectors such ^{as} ticks or mosquitoes. In disseminating biological agents the size of the particles is of extreme importance. A particle of from 1 to 5 microns in diameter is most effective in reaching the alveolar bed of the lungs. Larger particles are removed in the nasal passages in the respiratory tract; smaller

particles tend to be exhaled. Infectious agents reaching the alveoli are just about as effective in causing an infection as they would be if they would be if injected into tissue. 0

One of the major areas of differences between chemical and biological agents from the military viewpoint, is the time of onset of symptoms and the duration of affects. At present, chemical agents generally have a relatively short time of onset and a short period of affect, and this is for the incapacitating agents of course, The biological agents with their incubation periods have a longer period for symptoms to appear although for some of them, the toxins are quite short for example, and a longer period of disability. The military use of toxic materials depends on the nature of the particular agent involved. Of course, as a generality, the weight of biological material required to perform a certain mission is much less than the amount of chemical material would be because the organisms propagate. A single attack with biological agents could blanket an area of hundreds of thousands of square miles, whereas when we're talking about such an attack with chemical agents we're talking about tens of square miles.

Selection of an agent for a particular military task would depend upon the nature of the target and the personnel watched by that target. *If a an-agent-for-a-partie Commander were* attacking an enemy fortification occupied by enemy soldiers only he would want to use a quick acting lethal agent. He would want to kill as many of those soldiers as possible as quickly as possible so that he'd save his own men from any unnecessary casualties. He'd probably use an agent such as a nerve gas GB. If the target were a logistical area such as a rail head or a supply point located in ^a ~~the~~ city which was manned by mixed enemy soldiers and civilians, possibly even friendly civilians, he would select an incapacitating agent which would knock out the defenders, and the people of course, and immobilize the logistic operation until he could

overrun it. and take control of it. Circumstances would dictate whether a chemical agent with a shorter time of onset and shorter duration of effects would be used or whether he would use a biological agent ~~which~~ with it's longer incubation period and period of disability.

I'd like to emphasize one thing at this point. There's no question of the ability to infect men with biological agents which are released miles away from them. The only question which has not been determined by large scale tests is what proportion of the target personnel would be infected. On the defensive side there are adequate ways of protecting an individual or a group of individuals if you know the attack is underway. This is the difficult part, of course. Masks, when worn properly, protect, give excellent protection against both chemical and biological agents. Protective clothing, decontaminating methods, and other measures of protection are available. Methods of treating casualties are known or are being developed. Immunization techniques are available for many of the organisms of which we are talking, or of course, however, you don't have solid protection from most of your immunization techniques.

Going to the discussion of the humanitarian aspects of these weapons it is very difficult for me to see how anyone who has made any study of these weapons compared to what you get from other weapons can feel that the toxic weapons are inhumane--^{of}course no weapons are humane, they weren't designed to be humane--but when we're talking about comparative humanity it is very difficult for me to see how anyone can say that these weapons are inhumane. We evidently don't flinch too much about blowing off a couple of arms or half of a man's face or leaving a ~~mind~~ mindless or many of these common damages that you get from other weapons. Whereas we start crying bloody murder when a man is temporarily hurt. Generally this is true. For example, in the last large scale use of chemical agents, which

is WW I where we have a good picture, about 25% of the casualties the American expeditionary force suffered in WW I was from chemical agents. But only about 2% of these died. Now, the casualties from all other weapons (bullets, shells, bombs, and so forth) about 25% died. Going a little bit further, of those who became casualties from chemical weapons about 4% were disabled 6 years after the war, which is an indication of a long ^{term} ~~time~~ disability, ~~which is not a long term disability~~ Whereas about 25% of those again who were casualties from the other weapons were permanently disabled. So here on one hand for the chemical weapons we have 2% deaths against 25% deaths for the other weapons, on the other hand we have 4% long term disability against 25% for the other weapons. It is very difficult to see how you can compare these two and say that one of them is humane and one is not. General Gilchrist, a medical officer in the Army Medical Corps made a quite comprehensive comparison of casualties from various weapons after WW I, and based on three criteria, the proportion of deaths to those affected, the suffering at the time of injury and during convalescence, and the proportion of permanent disabilities, on these three bases, he made the statement after his study that gas is not only one of the most ^{of} ~~defective~~ weapons ever applied on the battlefield but it was also the most humane. And just as a item of current interest I saw in this morning's Chronicle an article which started on the front page about the nation's police being urged to consider a wider range of supplementary weapons of which ~~the~~ the main one is a chemical weapon which you've probably heard of is Mace, a report by the Institute of Defensive Analysis advocating that the police go much into the use of these nonlethal agents. And at one point they say

"The report says that "the overall reason for considering use of nonlethal weapons is "that law enforcement officer is neither permitted nor encouraged to use more force than is necessary to achieve his lawful objectives,"

Now it is very difficult for me to see why the same general humanitarian approach shouldn't be true in war. I don't see why you should have to go out and kill and maim people when you have other means of accomplishing your mission without necessary killing.

As far as morality is concerned, I'd just like to say on the legal side that the United States is not signatory to any treaty prohibiting the use of chemical or biological weapons.

This has been a very once-over-lightly treatment but after Dr. Lederberg is through I'm sure we'll take up all the rest of the points that anybody has in the discussion period.

Dr. Lederberg:

part
Well I will confess that the first of my colleagues presentation did appear like a chamber of horrors and I'm sure none of us can have escaped that reaction. Like him I ^{would} also point out that a graphic description of the results of bullets ^{would} plow into your brain ^{that had} ~~and have~~ ^{sprayed} been scraped from the machine gun would have an equal impact. I want to say from the outset that I don't disagree with him in the least with respect to attempts to compare the humanity and morality of one method of destroying compared to another. If the justified and politically founded objective of warfare is to destroy the enemy, the more expeditious techniques ^{are} of the disposal of the force we stand behind if we do stand behind it, presumably the better. Nevertheless both chemical and biological warfare do arouse a moral revulsion in most people, and while I believe I share this to a lesser extent than most and have said so, I think we should understand why life-science professionals will be especially sensitive about inhumane applications of their own studies. Most of us did not go into science with the expectation of supporting munitions activities and of course are not consulted about that point, but I think this is a very important base and I think one we ought to face realistically as to why so many biologists are raising such a furor. They feel that they had not elected to go into a line of work that would contribute to the destruction of other people, whether it is less or more humane than other techniques. That's why most of us are not working on munitions. We should not be too deeply swayed by these irrational considerations, and they are irrational, but on the other hand it would be a great mistake to dismiss their importance to other people because a great part of the political significance of our involvement in chemical and biological warfare is what other people think about it and to the extent that our involvement in these programs arouse ^{arouses} a few ^{irrational} ~~rational~~ anxieties on the parts of our friends as well as neutrals as well as potential enemies

I think that we have to consider that as part of the package, as part of the price that is paid by our being involved in these developments. These reactions may be irrational but they're there. One might approach that by attempts at public education but as Gen. Rothschild has indicated in the long run it would be the most humane to use chemical weapons. This might be demonstrated sometime as in for a little effective demonstration of this point in the field.

I mainly don't want to talk about chemical warfare since I feel particularly that lumping it together with biological warfare is a strategic error of very great significance. In fact my interest in this subject was aroused when Dr. Meselson asked me to sign a petition that was being circulated starting about a year ago, a good part of which was discussed in Science ^{for} January 20, and I'll just quote one point.

"The employment of any one CB weapon weakens the barriers to the use of others. No lasting distinction seems possible between incapacitating and lethal weapons or between chemical and biological warfare. If the restraints ^{on the use} of one kind of CB weapon are broken down the use of others will be encouraged." I think ~~that~~ there is just as much truth in that as our willingness to distinguish, or unwillingness to distinguish, these mechanisms of warfare will permit. That is, if we insist on our own propaganda on the question and lumping them together then a policy which validates the use of chemical warfare will weaken the restraints on the use of biological warfare. For reasons I will go into I would like to encourage you to adopt exactly the opposite point of view, to regard biological warfare as a very special kind of hazard to the species and just on those grounds alone ought to be carefully distinguished from use of chemical agents.

Among other points on the issue of political strategy I point out that the President of the United States is already committed to the use of chemical agents in warfare because in fact we are using them in the form of tear gas and so on, and it would be very much more difficult to achieve a policy reversal with respect to a set of actions which the country ^{through} ~~who~~ the President ^{has} ~~is~~ already committed than it would be to exercise some restraints with respect to the proliferation of other kinds of weapons. Here again our reasons to try to create whatever distinctions are possible between these classes of weapons.

Actually the main complaint that I would make about our present posture in this area is not so much what we are doing in our research and development programs in chemical ^{or in} ~~war and~~ biological warfare in the present world climate, the present political climate, I can see the ^e ~~sensit~~ to the argument that it is very difficult to do otherwise. My complaint is what we're not doing. My complaint is that we're not aggressively pursuing the means for international control of those kinds of weapons which represent most significant threats to the species. I think no microbiologist need use his imagination for very long to see why I regard biological warfare in that category. If in the present arena and atmosphere of complete lack of restraint, it is necessary for this nation to pursue BW development, that fact in itself makes it necessary for others and we have all the groundwork for ^a continuous process of escalation. There's just no way that can be stopped in the present atmosphere and every increase in our expenditure, in our defensive actions with respect to biological warfare in this country, and the conditions of secrecy which operate where it is not possible to disclose exactly what we're doing where the general magnitude of our effort is obvious can have no other consequence but to provoke similar defensive escalation on the part of other nations. I think we can take it for granted this is exactly

what has happened. I don't know the figures for the research budget in biological warfare of the Soviet Union or of Communist China.

The essential point that I'd like to bring to your criticism is that the calculated growth of the capacity for biological warfare is inherently a suicidal activity on the part of human beings. ^{It's} Exactly in opposition ^{and} to what so much of our scientific and technical [^] human effort has been for ^{in which it can} the control of pestilence, to try to bring to bring about ways [^] to be systematically disseminated. I'm going to say something about secrecy and I'm going to take a rather paradoxical position. There's a sense in which if were possible for the defense department to explore the research and development of biological agents and in fact [^] maintain utter and complete security with respect to its development I would not feel terribly uncomfortable. I would not feel that the possession simply in the hands of this country of this kind of power is the [^] worst thing that I can imagine happening in the world. What I am concerned is that no security system is perfect; ^{its} not in tended to be perfect, if for no other reason than to achieve budgetary support in Congress there will be constant dissemination of information about what biological warfare programs are up to and any escalation on their own developmental and research efforts is going to provide some of the necessary material for other countries to do exactly the same. ^{So} The effort [^] that we put into any large scale development of techniques for the development of more potent biological agents for their dissemination whether it's in one year or ten or twenty, is gradually going to become part of the art of the whole world. This is exactly in nuclear energy and it's bound to be the same if there is a large scale expansion of what we're doing in biological warfare. It is not our possession of dangerous information of dangerous technical insights but it is the dissemination throughout the world that represents a very obvious threat. The larger

industrial powers do not have to rely on biological warfare to achieve ^{their} ~~its~~ major strategic objectives. They are very well possessed of a wide variety of other kinds of weapons and even for defensive purposes while it is important that we have some notion of what kind of biological attack might be posed against us, it is not at all obvious why the strategic deterrent against biological warfare has to be another biological weapon, and we have plenty of strategic deterrent weapons. My concern is that biological warfare is a technique of extermination which is available to nations with much smaller industrial potential than our own, which would ^{be} politically much less responsible, which would be a much more situation of temptation to take desperate measures in order to achieve very parochial political aims. I do not think we can expect the same level of responsibility for the future of the rest of the planet on the part of the Egyptian Department of Defense than we do from our own.

These are the essential concerns, behind ^{them} ~~there~~ are also that the security system prevents the details of development and dissemination of microbial weapons from being accessible to the professional and medical scientific criticism of the rest of the community. I can easily visualize a very eager and very enthusiastic investigator in the chemical corps deciding on a rather limited initiative and subject to a rather limited degree of scrutiny and control because of the security system of performing experiments which would be hazardous to the entire country, and in fact to the world. The degree of review, control and criticism in a secure system cannot possibly compare to that which operates in a system of open science. I am really very much concerned that someone will take in his head to decide that some ^{new} ~~these~~ strain of anthrax ought to be tried out in the field without having the kind of control that the public consequences of such dissemination are going to be. I think this is one of the inevitable hazards of a system of

very tight or attempted tight security in military services. In fact you might make the same argument about the whole complexion of the program. That the military objectives are going to be paramount; that the human objectives of the development of weapons of this kind will never achieve the kind of review that they deserve in relation to the potential gravity of such developments for us as a species.

Without at this moment wishing to impair the existing defensive and developmental activities of the Defense Department in Biological warfare, I would submit that a problem of much higher priority is how to develop the kind of controls that will keep such activities both in this nation and in other nations under some kind of rational limitations. The one direction that I can see to this is a demand for the removal of secrecy by whatever expedients we can devise in such work. I think there are ^{good} ~~group~~ grounds for continuing various kinds of efforts that are related to biological warfare because there are also very much the same things that related to public health. But I can see very little reason even from a military standpoint why these must be blanketed in the kind of secrecy that now enclose them. Biological warfare is not a major strategic weapon in the United States. I don't believe anyone would sustain the proposition that the national security of this country really depends crucially on the secrecy of our activities in biological warfare. They might ^{be} politically embarrassing, but I don't know enough about what would be released by such information to have a clear insight into this point but it is obvious that the most tender aspect of biological warfare is just the fact that it is being done and the kind of anxieties that are aroused in the minds of people. I've seen very little to suggest really cogent reasons for maintaining any important degree of secrecy with respect to these operations. In fact, the kind of proposal I might be prepared to make

is that we enlarge our program in this area but we make it public. And we have it large enough that it can cover all the bases that we might otherwise think we might have missed. ^{In} This way biological warfare research will in fact be nothing else than public health research. We are faced by constant attack by microbial invaders of all kinds. We need to know about them by the natural dissemination how to protect ourselves against them much the same thing as involved in their artificial dissemination. The basis of ^{my} proposal of the abolition of ^{it} secrecy is that it is a step towards the control of weapons that the race cannot afford to have developed in secret without some kind of rational control ^{for what its ultimate} objectives are. Unlike other weapons we can afford to take some risks with respect to what the other side may be doing in biological warfare. We have other deterrents that could discourage unexpected attacks. We're not in the same position in trying to open up BW ~~and~~ ^{would be} in nuclear warfare. This could be the first area in which we could attempt to negotiate for the international control of weapons precisely because they are ~~of~~ weapons ~~of~~ ~~international~~ whose deployment has not been established and whose critical nature for our national security is already open to doubt. When biological warfare is developed as a utilitarian military tool to the extent that technologically less advanced countries can make full advantage of it we will have lost that advantage and may have indeed suffered a very important military disadvantage by being subject to attack on a much broader level from a much wider variety of countries than is now the case.

One particular approach that I think we might consider, although I realize how unrealistic it may sound, but I think if we could get ~~enough~~ our colleagues in enough countries started on this point some beginning might be made, would be a demand that no microbiological research could be classified. That this be part of the internal law of every country which is a participant in this kind of arrangement. One might argue that the

Soviet Union although a party to such a law could still afford to maintain clandestine research in microbiology. This would be exactly the texture of the concern about how you inspect a treaty of this kind. That is a hazard. I'm not sure there would be enough merit in the Soviet Union continuing to do such research with the risk of discovery that it was violating one of its own treaties embodied in its own internal law to warrant its doing so. I think to the extent that we can maintain communication with our scientific colleagues through the abolition of classification controls in other countries we've also reached an avenue of communication that goes far beyond the immediacy of the situation. I'll be glad to develop this thesis a little further, perhaps in some further discussion. But the particular proposal I have in mind is that even for a relatively closed society such as the Soviet Union it would be very difficult for it to maintain a public posture that makes it a matter of public policy of its own published law that work of this kind is not to be classified and for this to remain secret. It is very easy to keep things secret when there's a law that says they must be secret when there's a law that says they must not, there are very severe administrative difficulties to say the least that would involve maintaining really a very close enclosure of entire populations in order to maintain that kind of security. This sort of approach has never been tried as far as I know except in ~~the~~^a sense in the United States because we have such an aggressive newspaper industry that it achieves many of the same purposes as an explicit law for the publication of as wide a variety of subjects as possible. that keeps us an open society. I haven't expressed ~~the~~^{these} notions as clear as I might like, but I've done the best that I can with my voice and the limitations of time.

Gen. Rothchild:

I might comment on a couple of points that Professor Lederberg has brought out. These are sort of scattered as I wrote them down as they came.

One is ^{that} Dr. Lederberg mentioned that there is no demonstration of the use of CW weapons as humanitarian weapons in the field. This isn't quite right. CS, which is an incapacitating agent, chemical agent, it is an irritant agent, a type of tear gas, has been used very extensively in South Vietnam and one of the basic reasons it was started and one of the things it has been used for is to repel attacks when the Viet Cong have used women and children as shields. In fact I think there is an item in the paper just a couple of days ago where this ^{was} ~~was~~ another attack ^{and} launched but this has been quite general ~~but~~ rather than just having to shoot to protect yourselves you can break up on attack with this tear gas.

Another point he mentioned which is a camel nose under the tent kind of thing, in other words this was not Dr. Lederberg's approach. This was the approach of the petition he mentioned. I sort of get into an ambivalent situation when I start talking about this because on the side of nuclear weapons I'm very much in favor of ~~it~~. Let's not get the thing started at all then you can't ever build up to a WW III where you are having an all out nuclear war. But we have weapons, conventional weapons now, that can destroy huge numbers of people over large areas. We've had demonstrations in WW II we had Coventry, ^{for example} we had Rotterdam. Both completely leveled with high explosive bombs and Tokyo which was completely leveled with incendiaries. So what we call conventional weapons now can destroy practically any numbers of people you want to destroy. I think the thing that is involved here is the philosophy of the nation that is using the weapons. They don't need the biological weapons, for example, to destroy large numbers of people or the chemical weapons. They have the weapons now. So I'm not sure this camel's

nose under the tent has too much validity when you have a weapon that also gives you the possibility of a much more humane approach than you've had in the past. There are many other aspects of this that I won't take up particularly with regard to biological weapons but I wanted to get the general point.

When we talk about scientists working in the field of munitions, as long as we have wars and we haven't stopped the wars you must be prepared to fight wars. There's just no two ways of getting around ~~this~~. I think it is the duty of scientists as well as any other citizens to help their country be prepared to protect themselves and where their talents dictate, this is the field they work in. If we ever get restraints on war this would be fine. Then we could stop this. We don't have restraints at the present time.

I would question the possibility of experiments in biological weapons being dangerous to the country and to the world as being very likely. There is a great deal of review over most of the approaches to our small-scale, large-scale experiments, there are an extreme degree of restrictions ^{on} ~~in~~ using human volunteers. It's very difficult when you are using human volunteers your efforts of what you are going to do must be very carefully spelled out and it is ^{reviewed} ~~refused~~ by a great many people right up to the Secretary of Defense ^{to his} personal responsibility. We also have got a great deal of review by our civilian advisors. This includes the Committee from the American Society for Microbiology. Any type of experiment such as this is approached with great care. When you come right down to it, the secrecy in the field of biological weapons is relatively minor. About every month or two I get a stack of reprints from Detrick. ^{About so thick} They publish in [^] practically every area in which they work. All basic information is public.

The areas ~~that~~ in which secrecy is maintained comes down mostly to an agent which is considered a candidate agent and one which is developed to the stock piles and what is in our stockpiles. This is where secrecy exists. But most of the other work we do is published. We publish a great deal of ~~xxxx~~ material as I say on all basic ^{aspects} ~~abstracts~~ and in the protected areas both in laboratory protection, protection of laboratory personnel and in the protection of ~~the~~ personnel in the field. So there is relatively little secrecy in this area. It is minor except for the points that I have mentioned. ~~xxxxxxxx~~

Biological weapons are not only a deterrent though. There is again the possibility of these weapons being very effective militarily particularly in the field of incapacitating agents which is ^{most} ~~xxxx~~ suited to biological agents where you can find incapacitating agents, and to a *reasonable degree* control the damage you are going to do. The damage of course is mostly to people. It is not to material things. The same is true in the chemical field. I think you must consider whether you want to give up a weapon voluntarily, unilaterally which might be of great value to you again from the humanitarian aspect.

There are problems with respect to biological warfare which are not true in the case of chemical warfare. In chemical warfare as I say you can only cover small ~~areas~~, you can control your results to a closer degree. However you can do the same thing in the biological weapons field too. For example, the hardiness of the organism is going to have a great deal to do with how far that organism is going to travel. As you all know most organisms are killed when they are in the air in a few minutes in sunlight. They're just not going to exist long. So if you want to cover a very large area, you will probably disseminate the organism ^{at dusk} ~~as such~~ and get the whole ^{night} ~~night~~ which it can travel. *tend to live longer.*

However, if you want to cover a small area or a limited area you can put munitions down right on the area which disperse generally their small rotating ^{about as big} bomblets, dropped from a height so that they randomly distribute themselves when they hit the ground pressure will put out a small amount of biological material. You can put this down right on the area which you are specifically trying to affect and do it in the daytime. Those organisms are going to come out and they're going to be dead in an extremely short period of time. There is more control here. This isn't an uncontrolled proposition.

2. One of the things that I'm disturbed about is that there hasn't been more discussion in the field of biological weapons, agents, as to the possibility of establishing new ^{hosts} hopes which haven't been exposed as other species and, therefore, possibly have a continuing spread of this over a longer period of time. I'm not sure this a serious problem. I don't know enough about it. But there's been no discussion of this out in the public and I think it is an area that should be discussed and discussed thoroughly. We know, for example, that the normal host for plague is the rat. Plague happens to be one of your lethal agents. Whether you would use it or not I don't know but if you did would you establish new hosts in new species which would do damage to human people.

When we switch to an incapacitating agent, let's say the virus of ^{equine} Venezualean encephalomeilitis. Is this a danger or is this an unreal danger? This isn't a very dangerous agent in the first place. But then again going through these hosts is there a danger of increased toxicity, lethality. These are questions I think that deserve a lot more discussion and they are just getting silenced. This is not because of military secrecy. This is because of apathy more than anything else.

Dr. Lederberg:

I think it is exactly your last point that I'd like to respond to since I don't think we are in very great disagreement on most of the other issues and I'm not sure in disagreement on this one except for the kind of response we ought to ^{take} pay. My kind of concern is that a skilled researcher in biological warfare will develop a strain of dengue virus that he tests out on ten volunteers and says "Oh, this is perfect." "It will give a 36 hour incapacitation, they all recover beautifully." "We'll produce a very large stockpile on it." On the basis of what will necessarily be extremely inadequate evidence for the safety of its application may then sometime be used in a very large scale. As long as such work is developed within the framework of military security I don't see how it can come out any other way. It will be rather as if Fort Detrick had had the responsibility ^{for} of the development of the Sabin vaccine. And the question of the safety of the vaccine was itself a subject of military security. It was an agent disseminated on a very large scale for a humanitarian purpose. But we wouldn't dream of doing that because we know that in order to get a workable result we have to subject our efforts in an area that is subject to as much confusion and uncertainty as virology to the widest possible range of scientific criticism. And that criticism hasn't died down yet. I don't know any ^{really} important reason why candidate agents for military purposes can't be publicized along with the other 99% of the research that you are talking about and let the question of their safety and their humanity and all the rest of this be subject to a general scientific scrutiny before we commit ourselves as a nation to the use of these kinds of agents. One of the main reasons I say that is in the long run, the operation of military security is going to keep the scientists of this country from knowing about it and being able to apply their judgment. And it isn't going to be kept

a secret from the Soviet Union and Communist China. Their military intelligence is going to get at it as they have gotten every other really important major development that has come along. Meantime we will not be able to apply our criteria of scientific judgment on a sufficiently broad basis.

Gen. Rothschild:

I might just mention a couple of points on that. I don't think we're quite working on as small a scale as you mention, Dr. Lederberg, on the candidate agents. When you mention 10 people, I think we go larger than that. But don't forget we do have our civilian scientists who advise us on this. And we have a fair number. We certainly try to select well qualified ones. I admit that with no organic material ^{are you} you're not going to know what you're going to do until you put in an awful lot of people. But in wartime you don't quite have this choice. If we, for example, had selected ^{well any} three agents that we are going to stockpile and told everyone in the world what they were, normally you'll pick an agent which is not endemic to the area in which you might use it, the chances are that your opponent could definitely develop protective measures against and it would not be useful as an agent.

Dr. Lederberg:

You might have gotten the greatest ^{cost} effectiveness out of doing exactly that, you know, and a few plants with respect to the kinds of agents you pretend to stockpile can ^{in terms of} to the economic cost of the enemy make it justify the whole program. I'd be ^{you know did like to know} more content to know whether there was an extra ^{is} external and that almost has to mean civilians, review committee, for example the Public Health Service, that has the authority to inquire about the ~~safety~~ safety aspects of the

dissemination of agents and their development and it could really assure itself with regard to the point that you make. When you say there is a most careful review by an advisory group, an advisory group is usually told what the people who want the advice want it to be told. That isn't the exactly the kind of level of criticism that I'm thinking of.

Gen. Rothschild:

I think that the quality of people that we have...

Dr. Lederberg:

] It isn't a question of the quality of the people, it is a question of what they are told.

Gen. Rothschild:

They get complete disclosure of everything we have. You mention the Public Health Service, we always have someone from the Public Health Service on our Advisory ^{Committee} ~~board~~, ^{Muir} Dr. Alex Langer was on it for a long time and may still be, I don't know, I haven't been in close contact with the people. We have people, many of whom you know. I think we get adequate ^{Dr. Baldwin has been an advisor to us for a long time. We have many others} advisors and it seems to me that this is a place in which the ASM is very interested in seeing that we get good advice. So its ~~its~~ committee should be stocked with the best possible people you have and the most conservative and insure that the approach is proper.

Dr. Lederberg:

I have the greatest admiration for Dr. Baldwin and I've known him for a very long time and I know that in the context of ^a ~~the~~ professor at the University of Wisconsin he is a very competent advisor indeed because he can consult with a great many other people on questions where his own ^{expertise} ~~expertise~~ will be limited. You are dealing with a very broad range of questions and inevitably there will be. I think that to talk about the competence of an advisor in the context of his own information

when he is precluded from making further inquiry in getting further advice himself is really cake quite differently. As a matter of fact I'd like to press you on this point. Are these civilian advisors in fact informed with respect to every detail of the program in the areas we are talking about? Do they really have the whole picture available to them?

Gen. Rothschild:

Yes, the answer is yes. There is nothing they don't have available to them.

Question: *Dr. Clark*

Are they themselves sworn to secrecy.

Dr. Lederberg and Gen. Rothschild:

Yes, of course.

Gen. Rothschild:

But you see again the secrecy only applies to the area in which are kept secret, which are relatively minor areas.

Dr. Lederberg:

Well I believe might make a start on the policy that I've indicated. I think it is going to take a while to get a treaty that says we keep no secrets. But I think a formal statement and a commitment with respect to what activities are fully published and what activities are kept secret might itself be a good idea. I don't know ^{what} the guidelines are to the classification officers in this respect, and I imagine there would be a few documents about which there might be some marginal discomfort about whether to open it or not. That is just the point though, you see. I think if there were a policy that the area of biological ^{was} is so touchy that this must receive special consideration. Maybe the burden of proof ought to be on the other side.

Question lost - *Dr. Clark* ~~my~~ question about the two kinds of policies on secrecy.

Gen. Rothschild:

This was a matter of government policy, and this is one thing I have protested against ever since I got out and I can do it quite publicly. I can talk about our policy which says that we won't talk about chemical weapons, we won't talk about biological weapons freely. We don't even talk about them enough in the government to determine on a sound basis whether we should use them or not. I think that this is wrong and I say so now. So the two policies of restriction, military secrecy for example, still binds me if I know any secrets which I don't really...I've been out too long. But the restrictions through government policy don't affect me at all once I retired. These are the two areas that I was speaking about. There is no doubt that these hamper people in the service but in the biological field we have less restrictions, for example, than we have in the chemical field. The reason is because it is new. The chemical weapon field went through this from WW I. They got beat down so often on trying to put information out that they finally just gave up. They don't publish hardly anything. In the biological field, however, starting much more recently they have kept fighting to publish and they do publish quite freely. As I say I get an awful lot of papers, a constant outflow of papers from Detrick published in all the normal journals.

Dr. Lederberg:

That statement is often made but it doesn't really answer the point. It is the papers that don't get published that we're concerned about and which represent what is being classified and ^{they're} presumably the most sensitive aspect of the program. Again a statement with respect to the proportion of work is published is also pretty meaningless too. From this point of view. It is very hard to form judgments of policy based on what has been published when you know that the most sensitive areas aren't.

Ge. Rothschild:

By putting your top people on your committee advising Detrick you can insure that the best possible approach is made to the subject.

Dr. Lederberg:

I feel myself that ^{that} better than no ventilation at all, with respect to the issues immediately on the table, my only question is whether it is worth the fuss to have the Society as an official body involved in this. You can get at those same top people just as well, and since their judgments are kept top secret it is impossible for the rest of the Society to know whether it has any particular role in endorsing or not endorsing what they have to say. That capsules my own general reaction to whether there should be an official advisory committee of the ASM. I think the Services should be applauded for their efforts to get that kind of civilian advisory support. I guess I only feel it ought to be greatly enlarged, in fact ought to include everybody, and as close to everybody as you can manage to have.

Ge. Rothschild:

I think you bring in a great aspect of safety from the standpoint of the country when you will have a society such as the ASM designate who ^{advise} is going to ~~advise the Chemical Corps~~ Detrick rather than let them select their own advisors. Because there is a danger in this, ^{of} their selecting advisors that they work with and who they feel are going to tell them what they want to hear.

Dr. -Lederberg:

I think the much more important restraint is to publish the list of your civilian advisors and let the country judge whether they are a reputable group or not, you'll hear enough about it if they are not. You don't need the Society to do this and there is no mechanism of selection